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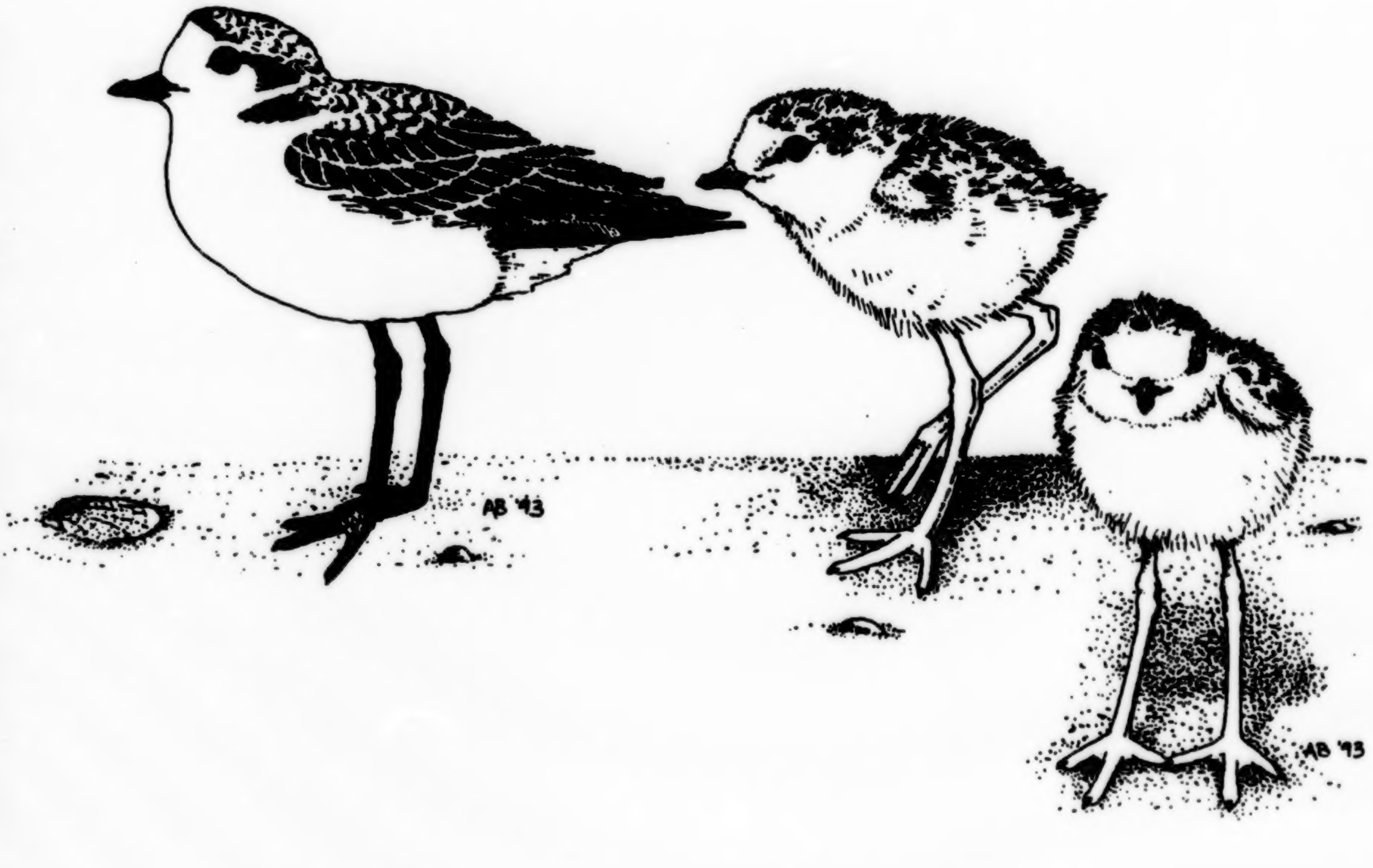
U.S. Fish & Wildlife Service

Environmental Assessment for the Comprehensive Management Plan

Tijuana Slough National Wildlife Refuge San Diego County, California



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ENVIRONMENTAL ASSESSMENT for the COMPREHENSIVE MANAGEMENT PLAN

TIJUANA SLOUGH NATIONAL WILDLIFE REFUGE
SAN DIEGO COUNTY, CALIFORNIA

March 1999

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Environmental Assessment for the Comprehensive Management Plan

Tijuana Slough National Wildlife Refuge
San Diego County, California

Chapter 1. PURPOSE OF AND NEED FOR ACTION

The U.S. Fish and Wildlife Service (Service) has prepared a Comprehensive Management Plan for the Tijuana Slough National Wildlife Refuge (Refuge). The purpose of the Comprehensive Management Plan is to guide management decisions and to identify strategies to meet the goals and objectives of the Tijuana Slough Refuge and the National Wildlife Refuge System. The Comprehensive Management Plan describes the following: (1) the purpose of the Tijuana Slough Refuge; (2) the fish, wildlife and plant populations, their habitats, and the archaeological and cultural values found on the Refuge; (3) significant problems that may adversely affect wildlife populations and habitats and ways to correct or mitigate those problems; (4) areas suitable for administrative sites or visitor facilities; and (5) opportunities for wildlife-dependent recreation. The Comprehensive Management Plan would fulfill the need for the Service to have a long-term management plan to address the numerous and complex challenges in managing the Tijuana Slough Refuge.

This Environmental Assessment evaluates the alternatives and environmental effects of implementing the Comprehensive Management Plan for the Tijuana Slough Refuge. The Service will use this Environmental Assessment to facilitate public involvement in the Refuge planning process and to determine whether the adoption and implementation of the Refuge Comprehensive Management Plan would have a significant effect on the quality of the human environment. This Environmental Assessment will aid the Service's decision-making process in accordance with the National Environmental Policy Act.

1.1 Proposed Action

The Service proposes to adopt and implement the Comprehensive Management Plan for the Tijuana Slough National Wildlife Refuge. The Comprehensive Management Plan would function as the long-term management plan for the Tijuana Slough Refuge.

1.2 Purpose of and Need for the Proposed Action

The Secretary of the Interior issued a directive titled "National Wildlife Refuge System, Guiding Principles for Management and Use" on December 15, 1995. This Secretarial directive called upon the Service to accelerate Refuge comprehensive management planning. On March 25, 1996, President William Clinton signed Executive Order No. 12996 titled "Management and General Public Use of the National Wildlife Refuge System." Executive Order 12996 stressed the need for public involvement in Refuge planning and management activities. The "National Wildlife Refuge System Improvement Act of 1997" was enacted on October 9, 1997. This new law directs the Secretary of the Interior to prepare a comprehensive conservation plan for each national wildlife refuge. The comprehensive conservation plan must identify and describe (1) the purpose of the refuge; (2) the fish, wildlife, and plant populations; (3) significant problems that may adversely affect wildlife populations and habitats; (4) areas suitable for administrative sites or visitor facilities; and (5) opportunities for fish-dependent and wildlife-dependent recreation. As a result of the Secretarial directive, Executive Order 12996, and the National Wildlife Refuge System Improvement Act, the Service initiated Refuge comprehensive management planning throughout the Nation. The completion of the Comprehensive Management Plan would fulfill the statutory requirements for long-term management planning at the Tijuana Slough Refuge pursuant to the National Wildlife Refuge System Improvement Act of 1997.

1.3 Project Area

The 1,022.50-acre Tijuana Slough Refuge is located southwest of the City of Imperial Beach, California (Figure 1). The Refuge includes 406.08 acres of lands under the primary administration of the Service and 616.42 acres under an overlay Refuge agreement with the U.S. Navy. The Service also has a lease with the State Lands Commission for State-owned tidelands in the Tijuana Slough Refuge. The Tijuana Slough Refuge occupies the northern end of the Tijuana River National Estuarine Research Reserve.

1.4 Decisions To Be Made

Based on the analysis documented in this Environmental Assessment, the Service's California/Nevada Operations Manager will make the following decisions:

- Select a Comprehensive Management Plan alternative that best fulfills the need for the Tijuana Slough National Wildlife Refuge to have a long-term management plan.

- Determine whether the implementation of the selected alternative would have a significant impact upon the quality of the human environment.

1.5 Issues Identified and Selected for Analysis

The Refuge Comprehensive Management Plan was prepared using a consensus-based planning process that involved numerous agencies and community groups. Major topics identified in the planning process are described and discussed in the Comprehensive Management Plan (January 1999). The following major issues, identified during the development of the Refuge Comprehensive Management Plan and at the December 1997 public workshop, are addressed in this Environmental Assessment:

- What impacts on the physical, biological, social, economic, archaeological, and historical environments will occur because of increased wildlife management programs? (Such as, providing higher levels of monitoring for endangered, threatened, rare, and migratory species; increased recovery actions for endangered and threatened species; increased law enforcement to control trespass through sensitive habitats; evaluation of contaminant threats and sites; increased control of invasive weeds; and periodic removal of trash and debris from salt marsh habitats.)

- What impacts on the physical, biological, social and economic, archaeological, and historical environments will occur because of increased visitor services? (Such as, implementing new environmental education and interpretive programs, providing wildlife-dependent recreation opportunities such as environmental education, interpretation, wildlife observation, wildlife photography, and fishing along the beachfront, integrating biological and water quality monitoring with environmental education, and installing new signs and displays.)

- What impacts on the physical, biological, social and economic, archaeological, and historical environments occur because of existing wildlife management programs? (Such as, monitoring endangered, threatened, rare, and migratory species; implementing key recovery actions for endangered and threatened species; providing law enforcement to control trespass through sensitive habitats; evaluating contaminant threats and sites; controlling invasive weeds; and intermittent removal of trash and debris.)

- What impacts on the physical, biological, social and economic, archaeological, and historical environments occur because of existing visitor services? (Such as, providing current levels of visitor services; providing wildlife-dependent environmental education, interpretation, wildlife observation, wildlife photography, and fishing along the beachfront; installing new signs and displays; and maintaining and improving existing trails.)

- What impacts on the physical, biological, social and economic, archaeological and historical environments will occur because of emergency dredging of the mouths of Oneonta Slough and Tijuana River, increased predator management, acquisition of additional lands along Sea Coast Drive, construction of new offices on easement lands, and relocation of damaged trails in the Tijuana River floodplain?

1.6 Issues Not Selected For Detailed Analysis

The following areas of concern have been noted by the Service. Because the implementation of the Refuge Comprehensive Management Plan would have slight to no impact on these issues, the following topics are not evaluated further in this Environmental Assessment.

- Flood Control in the Tijuana River Valley

  Flood control in the Tijuana River Valley is a complex problem. Identifying specific flood control projects for the Tijuana River Valley is beyond the scope of this Comprehensive Management Plan. A Goat Canyon Watershed Management Plan is in the early stages of development and the environmental impacts of this proposal are likewise beyond the scope of this document.

- Prescribed Burning

  The use of prescribed burning in habitat management and fuel load reduction would be addressed specifically in prescribed burn plans written for each project on the Tijuana Slough Refuge. A Refuge Fire Management Plan is being prepared for the Tijuana Slough Refuge. The analysis of the environmental impacts of prescribed burns within the Tijuana Slough Refuge is beyond the scope of this Environmental Assessment.

- Mosquito Control

  Mosquito abatement efforts would continue under any project alternative. The existing Refuge mosquito management plan is scheduled to be updated.

- Tijuana Estuary Tidal Restoration Program

  National Environmental Policy Act compliance for the Tijuana Estuary Tidal Restoration Program was completed by the California Coastal Conservancy and the Service in 1993.

- Sewage Treatment in the Tijuana River Valley

  Measures to address sewage spills and sewage treatment in the Tijuana River Valley are being implemented by the City of San Diego, International Boundary and Water Commission, U.S. Environmental Protection Agency, and other agencies.

- Future Expansion of the Visitor Center and Support Buildings

  Beyond the 1998 to 2003 planning period, the Comprehensive Management Plan has identified a need for an expansion of the public meeting area at the Visitor Center (either by extending the existing concrete patio or constructing an amphitheater in the southwest area of the Visitor Center), installation of an observation deck on the roof of the Visitor Center, and construction of temporary housing for interns and volunteers.

  The following proposals would need separate National Environmental Policy Act compliance documents to identify potential sites and to evaluate environmental impacts.

- New Roads

  No new roads are proposed for the Tijuana Slough Refuge under Alternatives A and B. Evaluation of any new roads in the Tijuana Slough Refuge would be subject to a new analysis pursuant to the National Environmental Policy Act.

- Research Activities

  Research activities within the Tijuana Slough Refuge would continue to be regulated through the issuance of a Special Use Permit by the Service or through the issuance of a joint research permit coordinated between the Service and the California Department of Parks and Recreation.

1.7 Other Related Agency Actions

The Comprehensive Management Plan also serves as the update for the 1986 Tijuana River National Estuarine Sanctuary Management Plan (California Coastal Commission, U.S. Department of Commerce, and Tijuana River National Estuarine Sanctuary Management Authority 1986). The Refuge Comprehensive Management Plan and the update of the Tijuana River Estuarine Reserve Management Plan have been integrated into a single document. Thus, the Comprehensive Management Plan serves as a joint management plan for the Tijuana Slough Refuge and the Tijuana River National Estuarine Research Reserve.

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The first public comment period on the Comprehensive Management Plan opened from December 8, 1997 and closed on January 26, 1998. A public meeting to discuss and receive comments on the Comprehensive Management Plan was held on December 9, 1997 in the City of Imperial Beach. Approximately 22 members of the public attended the December 1997 workshop.

The National Oceanic and Atmospheric Administration prepared a Final Environmental Impact Statement for the Tijuana River National Estuarine Sanctuary (U.S. Department of Commerce and California Coastal Commission 1981). The Tijuana River National Estuarine Sanctuary Management Plan, completed in 1986, was prepared with extensive public participation by agencies, community groups, and citizens (California Coastal Commission, U.S. Department of Commerce, and Tijuana River National Estuarine Sanctuary Management Authority 1986).

A Final Environmental Impact Report/Environmental Impact Statement for the Tijuana Estuary Tidal Restoration Program was completed in 1993 (California Coastal Conservancy and U.S. Fish and Wildlife Service 1993). The Restoration Program identifies numerous action items to restore and stabilize the ecological integrity of the Tijuana Estuary.

A Final Environmental Impact Statement for Endangered Species Management and Protection Plan for the Naval Weapons Station-Seal Beach and Seal Beach National Wildlife Refuge was completed in 1990 (U.S. Fish and Wildlife Service and U.S. Navy 1990). The Endangered Species Management Plan included the predator management plan for the Seal Beach Refuge. The Environmental Impact Statement and Endangered Species Management plan for the Seal Beach Refuge were used in developing the Environmental Assessment for the Comprehensive Management Plan for the Tijuana Slough Refuge.

1.8 National Wildlife Refuge System and Authorities

1.8.1 Mission of the U.S. Fish and Wildlife Service and National Wildlife Refuge System

The mission of the Service is to conserve, protect, and enhance the Nation's fish and wildlife and their habitats for the continuing benefit of the American people. The Service is the primary Federal agency responsible for conserving, protecting, and enhancing migratory birds, anadromous fishes, certain marine mammals, and endangered plants and animals and their habitats within the United States. This responsibility to conserve our Nation's wildlife resources is shared with other Federal, State, Tribal, local, and private entities.

As part of this responsibility, the Service manages the National Wildlife Refuge System. The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

1.8.2 Purpose of the Tijuana Slough National Wildlife Refuge

The Tijuana Slough Refuge was established on December 24, 1980 under the authority of the Endangered Species Act of 1973. The purpose of the Tijuana Slough Refuge is to conserve endangered and threatened species in accordance with the Endangered Species Act.

1.8.3 Goals of the Tijuana Slough National Wildlife Refuge

The goals of the Tijuana Slough Refuge reflect the core mission of the Service to protect and manage fish and wildlife resources of national importance while providing compatible wildlife-dependent recreational opportunities for the public to appreciate and enjoy the natural heritage of the San Diego region.

- Endangered Species/Essential Habitats: To protect, restore, and enhance native habitats to aid in the recovery of federally endangered and threatened species and to prevent the listing of additional species.
- Biodiversity: To protect, manage, and restore the rare coastal sage scrub, riparian woodland, vernal pool, coastal dune, and coastal salt marsh habitats representative of the biological diversity of the southwestern San Diego region.
- Cooperative Programs: To create partnerships and provide leadership in coordinating the land management activities of Federal, State, and local governments and agencies, and with academia, nonprofit conservation organizations, and citizens in support of the Tijuana Slough National Wildlife Refuge and Tijuana River National Estuarine Research Reserve.
- Migratory Birds: To provide breeding, migration, and wintering habitat for migratory birds, with emphasis on seabird and shorebird breeding habitat and wintering waterfowl habitat.
- Public Use: To provide safe and high-quality opportunities for compatible wildlife-dependent recreational activities that foster public appreciation of the unique natural heritage of the San Diego region.

1.8.4 Determining Compatible Uses of the Tijuana Slough National Wildlife Refuge

Unlike other Federal lands that are managed under a multiple-use mandate (e.g., national forests administered by the U.S. Forest Service and public lands administered by the U.S. Bureau of Land Management), units of the National Wildlife Refuge System are managed as primary use areas. That is, they are managed primarily for the benefit of fish, wildlife, and their habitats, and secondarily for other uses. In addition, refuges are closed to other uses unless specifically and formally opened.

Before uses are allowed on national wildlife refuges, Federal law requires that the proposed use be formally determined to be "compatible" with the purpose for which the refuge was established and with the mission of the National Wildlife Refuge System. The Refuge Manager also evaluates the availability of adequate resources including financial, personnel, law enforcement, and infrastructure as part of the overall compatibility process.

A refuge purpose may be specified in or derived from Federal law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum. In addition to providing a basis for making compatibility determinations, a refuge's purpose also serves as a vision or mission statement for refuge management. It provides a broad, long-term statement of management direction and priorities.

A compatible use is a use on a refuge that, in the sound professional judgement of the Refuge Manager, will not materially interfere with or detract from the fulfillment of the mission of the National Wildlife Refuge System or the purpose(s) for which the refuge was established. Some compatible uses may be supportive of refuge purposes, while others may be of a nonconflicting nature. All public uses, such as the public use of trails for observing wildlife, must be compatible with the purposes of the national wildlife refuge.

If the proposed use is found compatible, the use may be authorized by the Refuge Manager if management funds are available and other laws and regulations are satisfied. Compatibility determinations ensure that the wildlife resources are protected while providing for uses on the refuges that are consistent with wildlife conservation purposes. A list of compatibility determinations completed and in preparation for the Tijuana Slough Refuge is included in Appendix 1 of the Comprehensive Management Plan (January 1999).

1.8.5 Refuge Operating Needs System (RONS)

The Refuge Operating Needs System (RONS) is a planning, budgeting, and communication tool used by the Service to identify funding and staffing needs for the National Wildlife Refuge System. Using the RONS, each Refuge identifies projects, funding, and staffing requirements to meets its purposes, goals, and objectives. For the Tijuana Slough Refuge, 12 RONS projects have been identified (see Appendix 2 of the Comprehensive Management Plan).

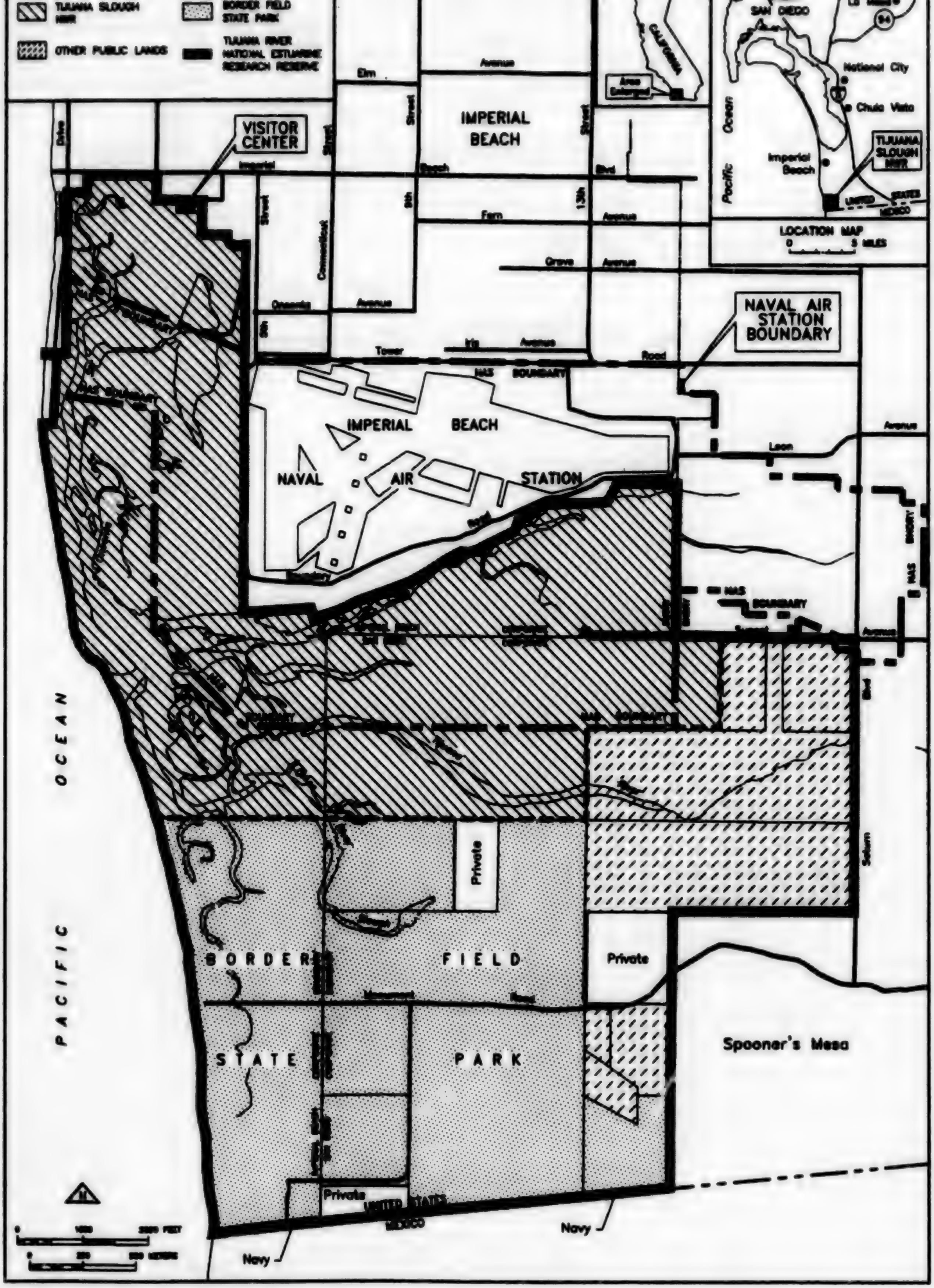

Figure 1. Tijuana Slough National Wildlife Refuge

Chapter 2. ALTERNATIVES, INCLUDING THE PREFERRED ALTERNATIVE

Chapter 2 describes two alternatives to implement the Comprehensive Management Plan for the Tijuana Slough National Wildlife Refuge. These two alternatives provide different levels of wildlife management and visitor services at the Tijuana Slough Refuge. The preferred alternative (Alternative A) provides increased levels of wildlife management and visitor services at the Tijuana Slough Refuge. The no action alternative (Alternative B) maintains the existing levels of wildlife management and visitor services, except for the inclusion of actions common to both alternatives (see Section 2.3 Actions Common to All Alternatives).

Actions common to both alternatives include emergency dredging of the mouths of the Tijuana River and Oneonta Slough, annual sand dune maintenance, predator management for the recovery of endangered and threatened species, acquisition of lands (former Napolitano tract) along Sea Coast Drive, construction of new offices and classroom by the California Department of Parks and Recreation on lands under easement to the State of California, and relocation of damaged trails in the Tijuana River floodplain (see Section 2.3 Actions Common to All Alternatives). The proposed predator management program at the Tijuana Slough Refuge is substantively similar to the endangered species management program at the Seal Beach National Wildlife Refuge (U.S. Fish and Wildlife Service and U.S. Navy 1990). This chapter also provides a comparative summary of the environmental consequences of each alternative.

2.1 Alternative A: Implement Refuge Comprehensive Management Plan to Provide Increased Levels of Wildlife Management and Visitor Services (Preferred Alternative)

Under Alternative A, the Service would provide increased levels of both wildlife management and visitor services at the Tijuana Slough Refuge (see also Section 2.3 Actions Common to All Alternatives).

Increased wildlife management programs at the Tijuana Slough Refuge would include the following actions:

- Higher levels of monitoring endangered, threatened, rare, migratory, and resident species. Standard survey techniques using trained biologists would be used to monitor wildlife and plant species on Refuge lands.

    Surveys of the endangered California least tern, threatened western snowy plover, endangered light-footed clapper rail, endangered least Bell's vireo, endangered southwestern willow flycatcher, endangered salt marsh bird's beak, State-listed endangered Belding's savannah sparrow, and other rare species would be conducted.

Surveys of migratory shorebirds and seabirds would be conducted.

Surveys of plant and invertebrate populations endemic to vernal pools and monitoring of pool hydrology would be conducted.

Integration of predator abundance surveys would be conducted with endangered and threatened species monitoring. Predator populations would be monitored using several techniques, including monthly night surveys of predators and daytime surveys of predator signs.

Surveys of other native wildlife and plant species (based on available staffing and funding) would be conducted.

- Increased recovery actions for endangered and threatened species.

Light-footed clapper rail: (1) remove sand obstructing tidal circulation in the channel, (2) develop fringing freshwater marsh, (3) enhance *Spartina* vigor, (4) control human disturbance and free-roaming pets, (5) control pollutants, (6) control debris, (7) identify and resolve water quality problems, (8) coordinate with vector control personnel, (9) monitor population and distribution, (10) establish and monitor permanent vegetation transects, (11) monitor effects of sand removal and tidal enhancement on vegetation, and (12) monitor invertebrate populations (U.S. Fish and Wildlife Service 1985).

California least tern: (1) develop and implement least tern management plan, (2) protect existing coastal feeding grounds, (3) restore tidal influence in portions of the north and south reaches of the estuary, (4) monitor least tern populations to determine status, distribution, and progress of management during the breeding season, (5) determine factors affecting the choice of location for roosting, loafing, and feeding areas used during the breeding and post-breeding seasons, and (6) identify factors causing colony disruption and nest site abandonment (U.S. Fish and Wildlife Service 1985).

Least Bell's vireo: (1) protect and manage riparian and adjacent upland habitats, (2) conduct annual population and habitat monitoring, (3) control cowbird parasitism, (4) control nonnative plant species, and (5) conduct habitat restoration (U.S. Fish and Wildlife Service 1998). Recovery actions for the least Bell's vireo would also benefit the recovery of the endangered southwestern willow flycatcher.

Vernal Pools Listed Species: (1) determine listed species composition and abundance in vernal pools, (2) map distribution and configuration of vernal pools, (3) rehabilitate and enhance vernal pools and watershed, and (4) monitor listed species, habitat, and hydrology (U.S. Fish and Wildlife Service 1997).

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- Increased efforts to eradicate exotic plants throughout the Refuge.

  Particular focus would be on controlling sea fig, tamarisk, and giant cane. A variety of techniques would be used, including herbicide application, hand removal, and salt addition (Comprehensive Management Plan, Chapter 5: Resource Protection, Management, and Restoration). Priority areas for weed control include coastal back dunes and upper marsh, Tijuana River valley, and disturbed upland areas on Refuge lands and at Border Field State Park. The major weeds identified for control include sea fig, tamarisk, giant cane, and chrysanthemum. Management agencies within the Tijuana River Reserve would coordinate weed control efforts.

- Increased law enforcement to control trespass through sensitive habitats.

- Regular maintenance program using staff and volunteers to periodically remove waterborne trash and debris from Oneonta Slough and along the beach. A floating boom may be installed across Oneonta Slough to capture floating trash and debris. Removal of debris and the maintenance of the floating boom would be a long-term ongoing activity.

- Monitoring of contaminant threats and evaluating contaminant sites.

Visitor services at the Tijuana Slough Refuge would be expanded. Visitor services are defined to include environmental education, interpretation, wildlife observation, wildlife photography, other potential wildlife-dependent recreational activities, and trail uses that are compatible with the purposes of the Tijuana Slough Refuge. These increased services include the following:

- Implementing new environmental education and interpretive programs.

- Providing wildlife-dependent recreational opportunities.

- Integrating biological and water quality monitoring with environmental education.

- Constructing wildlife observation and photography blind(s).

- Installing new signs and displays.

- Improving existing and develop new trails (see Comprehensive Management Plan, Chapter Eight: Public Access, Involvement, and Use Plan and Chapter Nine: Facilities Plan-Buildings, Trails, and Roads).

- Enhance certain existing accessible trails to increase opportunities consistent with the Americans With Disabilities Act and to support new environmental education programs.

- Construct a new trail that links Grove Avenue to the Service's kiosk and trail head on Fifth Street and Iris Avenue. This new trail would complete a continuous trail link from the Visitor Center to the Tijuana Estuary. This proposed project would improve an existing undeveloped trail to meet Refuge trail standards and would also be constructed to be accessible consistent with the Americans With Disabilities Act. Improvements to this trail would include minor grading and drainage improvements, placement of decomposed granite as a walking surface, installation of a culvert over a drainage swale, and minor disturbances to native vegetation.

2.2 Alternative B: Implement Refuge Comprehensive Management Plan to Provide Existing Levels of Wildlife Management and Visitor Services (No Action Alternative)

Under Alternative B, the Service would maintain the existing levels of wildlife management and visitor services at the Tijuana Slough Refuge and would also include the actions common to both alternatives (see Section 2.3 Actions Common to All Alternatives).

The existing wildlife management program would continue to focus primarily on the recovery of the endangered California least tern, endangered light-footed clapper rail, endangered least Bell's vireo, and threatened western snowy plover and includes the following actions:

- Monitor certain endangered and threatened species.

  Survey populations of the endangered California least tern, threatened western snowy plover, endangered light-footed clapper rail, endangered least Bell's vireo, endangered salt marsh bird's beak, and State-listed endangered Belding's savannah sparrow.

  Monitor predator abundance using daytime surveys of predator signs.

- Recovery actions for endangered and threatened species.

  Light-footed clapper rail: (1) remove sand obstructing tidal circulation in the channel, (2) control human disturbance and free-roaming pets, (3) control water borne debris, (4) coordinate with vector control personnel, and (5) monitor population and distribution (U.S. Fish and Wildlife Service 1985).

  California least tern: (1) restore tidal influence in the north reach of the estuary, and (2) monitor least tern populations to determine status, distribution, and progress of management during the breeding season (U.S. Fish and Wildlife Service 1985).

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- Least Bell's vireo: (1) protect and manage riparian and adjacent upland habitats, (2) conduct annual population and habitat monitoring, and (3) control cowbird parasitism (U.S. Fish and Wildlife Service 1998).

- Eradicate exotic plants. Most weed control has been on the northern end of the Refuge.

- Provide law enforcement to control trespass through sensitive habitats.

- Maintain intermittent efforts to periodically remove waterborne trash and debris from Oneonta Slough and along the beach using volunteers. Under Alternative B, a floating boom would not be installed across Oneonta Slough to capture floating trash and debris.

- Evaluate known contaminant sites.

Visitor services at the Tijuana Slough Refuge would be maintained at existing levels. Visitor services are defined to include environmental education, interpretation, wildlife observation, wildlife photography, other potential wildlife-dependent recreational activities, and trail uses that are compatible with the purposes of the Tijuana Slough Refuge. These services include the following:

- Provide environmental education and interpretive programs.

- Support wildlife-dependent recreational opportunities.

- Install new signs and displays.

- Maintain and improve existing trails (see Comprehensive Management Plan, Chapter Eight: Public Access, Involvement, and Use Plan and Chapter Nine: Facilities Plan-Buildings, Trails, and Roads). The Service would continue to maintain existing accessible trails consistent with the Americans With Disabilities Act.

  Maintain certain existing accessible trails to provide opportunities consistent with the Americans With Disabilities Act and to support new environmental education programs. Trail enhancements would include modifications of grades, improvements to trail surfaces, and better drainage.

2.3 Actions Common to All Alternatives

Management actions common to all alternatives include emergency dredging of the mouths of the Oneonta Slough and Tijuana River, annual sand dune maintenance, predator management, construction of new offices and classroom by the California Department of Parks and Recreation on lands under easement to the State of California, acquisition of additional land along Sea Coast Drive (former Napolitano property), and relocation of damaged trails in the Tijuana River floodplain.

2.3.1 Emergency Dredging of the Mouths of the Oneonta Slough and Tijuana River

The Service would conduct emergency dredging to open the mouths of Oneonta Slough and Tijuana River in the event that these channels are blocked by sand from storms. Failure to conduct emergency dredging at the mouths of the Oneonta Slough and Tijuana River would result in serious biological impacts to salt marsh and endangered species habitats. The goal of the emergency dredging would be to restore the mouths of the Oneonta Slough and Tijuana River to the original project conditions.

Maintaining tidal exchange and restoring the tidal prism of the Tijuana Estuary is recognized as one of the most important management needs for both the Tijuana Slough Refuge and Tijuana River National Estuarine Research Reserve. The periodic closures of the mouths of Oneonta Slough and Tijuana River have had adverse impacts to estuarine and salt marsh habitats and to the endangered light-footed clapper rail and endangered salt marsh bird's beak. During the winter of 1982 to 1983 and from April to December 1984, the mouth of the Tijuana River was completely blocked by sand. During the 1984 river mouth closure, the estuary became hyper-saline and there was a substantial dieback of salt marsh vegetation. The endangered light-footed clapper rail was nearly extirpated from the Tijuana Estuary as a result of the 1984 river mouth closure.

As an emergency action, the Tijuana Slough Refuge dredged open the mouth of the Tijuana River in 1983, 1984, and 1986. In 1985 and 1987, the Service dredged a portion of lower Oneonta Slough to restore the tidal prism of the Tijuana Estuary. Since this restoration work, the mouths of the Tijuana River and Oneonta Slough have remained open. However, given the sedimentation of the Tijuana Estuary and historical loss of tidal prism, the mouths of the Tijuana River and Oneonta Slough are likely to close again.

Recognizing this critical need, the 1986 Tijuana River National Estuarine Sanctuary Management Plan identified the "Initial reopening and maintenance of the estuary's mouth" as the highest priority restoration project in the Tijuana River Reserve. The 1986 Management Plan further states:

> Closures of the Tijuana River mouth in 1983 to 84 have caused serious public health hazards and ecological changes. The highest priority over the short term is to dredge dune sand from the major estuarine channels to restore and increase the tidal prisms and keep the mouth open.
>
> If properly executed, dredging per se will probably have few negative impacts on threatened or endangered species of the estuary, especially if done after the least tern nesting season. Increased turbidity could occur over the short term, but this may have no impact given the turbid nature of tidal waters even under

> normal circumstances. Overall however, the long-term benefits of improved circulation in the estuary will by far outweigh any potential short-term impacts.

The Refuge Comprehensive Management Plan (January 1999) also recognizes the critical need to maintain the opening of the Tijuana River mouth:

> Storm and flood events will occur, that close the mouth of the river to the Pacific Ocean. Such closures will be addressed aggressively with immediate action to reopen the estuary to the tides. Response planning with regulatory agencies is ongoing to ensure quick responses to closure events.

The scope of the proposed emergency work is similar to the work that was conducted by the Service in 1984, 1985, and 1987 for the Tijuana Slough Restoration Project (CD-41-84). This project restored approximately 900 feet of tidal channel along Oneonta Slough and 300 feet of beach at the mouth of the Tijuana River. The California Coastal Commission concurred in 1984 with the Service's consistency determination to open the Tijuana Estuary tidal channel and found that the project was "consistent to the maximum extent practicable with the policies and objectives of the California Coastal Management Program." The Service's emergency plan to open the mouths of the Tijuana River and Oneonta Slough in the event of a closure is consistent with past restoration activities, is similar in scope and magnitude to the work approved by the Coastal Commission in 1984, and is described in the 1986 Management Plan that was endorsed by the California Coastal Commission. On May 6, 1998, the California Coastal Commission concurred with the Service's determination that the proposed emergency dredging would not adversely affect any coastal zone resources. The proposed emergency dredging would be conducted under the authority of U.S. Army Corps of Engineers' General Permit GP-019-DZ.

2.3.2 Annual Sand Dune Maintenance

Under Alternatives A and B, the Service would continue the seasonal reestablishment and stabilization of the sand dune system north from the mouth of the Tijuana River to the southern terminus of Sea Coast Drive. Approximately 5,280 cubic yards of sand would be moved by the proposed restoration work. This maintenance is needed to protect the physical integrity of the Tijuana Estuary. Because of the past and continuing loss of dune vegetation, the movement of sand from wind and storm waves into estuarine channels (and thereby blocking tidal flushing) is a continuing threat to the Tijuana Slough Refuge. Sand dune maintenance involves the use of heavy equipment to rebuild the coastal dune system between the end of Sea Coast Drive and the mouth of the Tijuana River. Work is scheduled to avoid the nesting season of the endangered California least tern and threatened western snowy plover and to minimize burial of dune vegetation. Under both alternatives, beach sand is piled to rebuild the sand dunes, and the physical appearance of this short section of beach is modified. As native vegetation recovers on the dune systems, the need to reestablish the dune system is expected to decline over time.

2.3.3 Predator Management for the Recovery of Endangered and Threatened Species

Predator management is essential for the recovery of the endangered California least tern, endangered light-footed clapper rail, endangered least Bell's vireo, and threatened western snowy plover at the Tijuana Slough Refuge. Without active predator management, severe losses to eggs, chicks, fledglings, and adults of the California least tern, light-footed clapper rail, least Bell's vireo, and threatened western snowy plover would occur and the continued recovery of these listed species would be jeopardized. Predator management also includes the removal of the brown-headed cowbird to reduce nest parasitism on the endangered least Bell's vireo and other native birds (U.S. Fish and Wildlife Service 1998).

Various physical modifications and structures (electric fences, moats, nesting rafts, perching deterrents, and improved cover) were considered for the predator management program at the Tijuana Slough Refuge (U.S. Fish and Wildlife Service and U.S. Navy 1990). These structural alternatives can be effective under appropriate situations, however, electric fences and moats were not considered feasible for the conditions at the Tijuana Slough Refuge. At the Tijuana Slough Refuge, providing improved cover for California least tern and western snowy plover chicks, installing nesting rafts for the light-footed clapper rail, and reducing perching sites for avian predators are feasible.

While electric fencing is effective at the Seal Beach Refuge, opportunities to use electric fences at the Tijuana Slough Refuge are more limited for the following reasons: (1) the dispersed locations of the California least tern colonies at Tijuana Slough would require that the fence be reconstructed each year depending upon the nesting location or a large area would need to be permanently fenced and maintained, (2) the use of electric fencing at Tijuana Slough may conflict with the public's recreational use of the beach, and (3) salt spray and corrosion would result in continual maintenance problems with the electric fence. Thus, electric fencing is not considered viable at the Tijuana Slough Refuge. However, short-term experiments on the selective use of electric fencing may be considered as technology and practices improve.

Moats that encircle nesting islands for the California least tern and western snowy plover can provide a physical barrier to mammalian predators. However, construction of moats and nesting islands would be expensive and would cause major environmental impacts from dredging new channels through the back dunes and sand beach. Maintaining the moats and nesting islands, particularly in a highly dynamic flood plain and shoreline, would be expensive. Thus, construction of moats and nesting islands was determined to be infeasible at the Tijuana Slough Refuge.

Potential perch sites for avian predators in the vicinity of the California least tern and western snowy plover nesting areas would be removed. Commercially available anti-perching deterrents would be installed on Refuge signs, fence posts, and other structures in the vicinity of the least tern and western snowy plover colonies to limit potential perch sites for avian predators. Potential perch sites for avian predators would be continually evaluated.

To provide chicks with increased cover from predators, clay roofing tiles are often placed within California least tern and western snowy plover colonies. The chicks can hide under the roofing tiles and thereby escape predation. Clay roofing tiles could be placed within the nesting colonies at the Tijuana Slough Refuge to increase the amount of escape cover for chicks from predators.

The recovery of the endangered light-footed clapper rail would be enhanced by installing nesting rafts in salt marsh habitats at the Tijuana Slough Refuge.

Various behavioral modification techniques were evaluated to manage predators at the Tijuana Slough Refuge. These techniques include electronic distress sounds, propane exploders, crackershells, pyrotechnics, effigies, scarecrows, baiting/artificial feeding, lights, chemical repellents, decoys, contraception, and chemical repellents (U.S. Fish and Wildlife Service and U.S. Navy 1990). Hazing techniques (such as pyrotechnics, crackershells, and audio and visual stimuli) would be used, provided these techniques would not disturb listed species. Other behavioral modification techniques would be considered and implemented as additional effective methods become available and approved.

Various predator population management techniques specifically targeted to problem species were evaluated. These techniques include live trapping and relocation elsewhere in the wild; live trapping and relocation to zoos, wildlife care centers, and research facilities; live trapping and euthanization; and shooting (U.S. Fish and Wildlife Service and U.S. Navy 1990). Live trapping may include box style traps and padded jaw steel traps for mammals, Bal-chatri and other traps for raptors and other avian predators, and decoy funnel traps for cowbirds (see Comprehensive Management Plan, Chapter 5, Resource Protection, Management, and Restoration). Public recreational hunting and public trapping would not be used to manage predator populations on Refuge lands.

2.3.4 Acquisition of Additional Lands Along Sea Coast Drive

Private lands along Sea Coast Drive (formerly known as the Napolitano tract) were acquired in 1998 through joint funding provided by the City of Imperial Beach, California Department of Transportation, and California Coastal Conservancy. The existing fill is scheduled to be removed by the California Department of Transportation to restore salt marsh habitat. This tract of land would be conveyed to the Service and included within the Tijuana Slough Refuge. The Service would acquire this tract of land under both alternatives. This tract would be donated to the Service and the habitat would be restored at no cost to the Service.

2.3.5 Construction of New Office and Classroom Space by the California Department of Parks and Recreation on Lands Under Easement to the State of California

In the short term (1998 to 2003 planning period), new construction is planned by the California Department of Parks and Recreation to provide additional office space and a new classroom on lands under easement to the State of California (see Comprehensive Management

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Plan, Chapter Nine: Facilities Plan - Buildings, Trails, and Roads). The proposed additional office space would be located in the south end of the existing garage building. The California Department of Parks and Recreation proposes to close the open bay at the south end of the garage and convert that space into offices. These projects would be funded by the California Department of Parks and Recreation and the National Oceanic and Atmospheric Administration.

2.3.6 Relocation of Damaged Trails in the Tijuana River Floodplain

The Service may rehabilitate or relocate certain trails damaged by periodic flooding and erosion in the Tijuana River floodplain. Specific flood-prone trails and substitute trails within the Refuge have not been identified at this time and planning and implementing this project would include coordination with the local trail users and San Diego County. Flood-damaged trails would be relocated to nearby less flood-prone alignments in order to continue public access, minimize maintenance costs, and protect public health and safety.

2.4 Comparison of Management Actions Between Alternative A and Alternative B

Table 2-1 provides a comparative summary of the environmental consequences of each alternative. Environmental impacts are analyzed in more detail in Chapter 4.

Table 2-1. Comparison of Management Actions Between Alternative A (Preferred Alternative) and Alternative B (No Action Alternative).

Management Action	Alternative A	Alternative B
Wildlife Management Programs	Increased wildlife management programs: higher levels of monitoring of endangered and threatened species, increased recovery actions, more law enforcement, periodic removal of trash and debris from Oneonta Slough, and increased monitoring of contaminants.	Maintain existing wildlife management programs: limited monitoring of certain endangered and threatened species, limited recovery actions, existing law enforcement, intermittent removal of trash and debris from Oneonta Slough, and current monitoring of contaminants.
Control of Invasive Weeds	Increased effort to eradicate invasive weeds.	Maintain existing effort to eradicate invasive weeds.

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Table 2-1 Continued

Visitor Services	Increased visitor services: new environmental education and interpretive programs, integration of monitoring and education programs, construction of new wildlife observation blinds, installation of new signs and displays, enhance certain trails for increased access, and construction of new trail at Grove Avenue.	Maintain existing visitor services.
Emergency Dredging of the Mouths of Oneonta Slough and Tijuana River	Common to both alternatives	Common to both alternatives
Annual Sand Dune Maintenance	Common to both alternatives	Common to both alternatives
Predator Management for the Recovery of Endangered and Threatened Species	Common to both alternatives	Common to both alternatives
Acquisition of lands along Sea Coast Drive	Common to both alternatives	Common to both alternatives
Construction of New Offices and Classroom by the State of California on Service lands	Common to both alternatives	Common to both alternatives
Relocation of Damaged Equestrian Trails in the Tijuana River Floodplain	Common to both alternatives	Common to both alternatives

Chapter 3. AFFECTED ENVIRONMENT

Chapter 3 describes the physical, biological, social and economic, and archaeological and historical environments that would most likely be affected by the project alternatives (Zedler, Nordby, and Kus 1992; California State Polytechnic University, Pomona 1989; California Coastal Commission *et al.* 1986). The reader is referred to Chapter One: Natural, Physical, and Cultural Context of the Comprehensive Management Plan (January 1999) for a more complete discussion of the physical, biological, and cultural environments of the Tijuana Slough Refuge.

3.1 Physical Environment

The Tijuana Slough Refuge encompasses the northern and central arms of the Tijuana Estuary and the lower reaches of the Tijuana River. The Tijuana Estuary, a submerged river valley, is formed by the intermittent mixing of fresh water from the Tijuana River and tidal flushing from the Pacific Ocean. The Tijuana River flows intermittently and its hydrology has been modified by the construction of upstream reservoirs and chronic sewage spills. A sand beach and dune system front the Tijuana Slough Refuge along its western boundary at the Pacific Ocean.

3.2 Biological Environment

The Tijuana Slough Refuge is characterized by habitat types that are critically important to several endangered, threatened, and migratory species. In the northern and central arms of the Tijuana Estuary, the characteristic habitat types are salt marsh, tidal channels, mudflats, sand beaches, and dunes. Together, these habitats support the endangered California least tern, endangered light-footed clapper rail, endangered brown pelican, endangered salt marsh bird's beak, threatened western snowy plover, and State-endangered Belding's savannah sparrow. These estuarine and beach areas also provide important habitats for many species of migratory shorebirds and waterfowl. Coastal sage scrub and vernal pools are also found within the Refuge.

The lower reaches of the Tijuana River (upstream from the tidal estuary) are characterized by riparian and upland habitats. These riparian habitats, located along the floodplain of the Tijuana River, are dominated by mulefat scrub, willows, and cottonwoods. A portion of the riparian habitat along the Tijuana River is formally designated as critical habitat for the endangered least Bell's vireo. The Tijuana Slough Refuge also borders designated critical habitat for the least Bell's vireo. The endangered southwestern willow flycatcher and many species of migrant songbirds may also be found in the riparian zone of the Tijuana River. The endangered American peregrine falcon is observed regularly in the Tijuana River Valley.

3.3 Social and Economic Environment

The Tijuana Slough Refuge is located southwest of the City of Imperial Beach. The City of Imperial Beach has a population of approximately 28,344 (SANDAG 1995). The Refuge falls within the corporate boundaries of both the cities of Imperial Beach and San Diego. The U.S. Navy's Imperial Beach Navy Outlying Landing Field abuts the Refuge, and a portion of the Navy lands are included as an overlay wildlife refuge.

The Tijuana Slough Refuge also includes a visitor center, parking area, and garage. The visitor center is operated by the California Department of Parks and Recreation on a 7-acre site leased to the State of California by the Service. The visitor center provides office space, interpretive exhibits, reception desk, bookstore, library, classroom, and audio-visual room. The garage is used to store vehicles and maintenance equipment. The Refuge maintains foot and equestrian trails north and south of the Tijuana River. The Fifth and Iris Trail is also posted for equestrian and bicycle use. The reader is referred to Chapter Eight: Public Access, Involvement, and Use, and Chapter Nine: Facilities Plan - Buildings, Trails, and Roads of the Comprehensive Management Plan for a more complete description of the facilities and trails.

3.4 Archaeological and Historical Resources

Archaeological resources within and adjacent to the Tijuana Slough Refuge have been identified (California Department of Parks and Recreation 1974, City of San Diego 1981, and Affinis 1991). Approximately 16 archaeological sites have been identified in the nearby Border highlands area and along the shore. These resources include lithic scatters; quarry site; scatters of shells, cores, and debitage; and middens (Affinis 1991). A Kumeyaay village site, known as Millejo, was located within the Tijuana River Valley. This village has since been buried by sediments from floods (Affinis 1991). The area encompassed by the Tijuana Slough Refuge, as well as the Tijuana River Valley, was originally inhabited by the Kumeyaay.

Chapter 4. ENVIRONMENTAL CONSEQUENCES

Chapter 4 discusses and analyzes the environmental impacts expected to occur from the implementation of either Alternative A (preferred alternative) or Alternative B (no action alternative) as described in Chapter 2. Environmental consequences of management actions common to both Alternative A and Alternative B are analyzed in Section 4.3 Environmental Consequences Common to All Alternatives. Direct, indirect, and cumulative impacts are described where applicable for each alternative. Table 2-1 provides a comparative summary of the two alternatives. The environmental impacts from the Tijuana Estuary Tidal Restoration Program have been previously analyzed (California Coastal Conservancy and U.S. Fish and Wildlife Service 1993).

4.1 Environmental Consequences of Implementing Alternative A (Preferred Alternative). Implement Refuge Comprehensive Management Plan to Provide Increased Levels of Wildlife Management and Visitor Services.

4.1.1 Effects on the Physical Environment from Increased Wildlife Management Programs

Implementing increased wildlife management programs would have only minor impacts upon the physical environment of the Tijuana Slough Refuge. Providing higher levels of monitoring for endangered, threatened, rare, and migratory species; increased recovery actions for endangered and threatened species; increased law enforcement to control trespass through sensitive habitats; and the evaluation of contaminant threats and sites would not result in any major modifications to the physical environment. None of these management actions would increase soil erosion, degrade coastal water quality, or alter the topography or landforms of the Tijuana Slough Refuge. The physical condition of the beach and tidal exchange in Oneonta Slough would be improved by the periodic removal of trash and debris.

4.1.2 Effects on the Biological Environment from Increased Wildlife Management Programs

Increased wildlife management programs would have positive impacts on the biological environment of the Tijuana Slough Refuge. Higher levels of monitoring for endangered, threatened, rare, and migratory species would provide information on species status, habitat condition, and population trends. Increased recovery actions for endangered and threatened species would forestall the extinction of listed species and conserve native biological diversity. Increased law enforcement to control trespass through sensitive habitats would reduce disturbances to listed species and maintain the quality of habitats. Evaluation of contaminant threats and sites would provide information on the potential exposure and pathways of contaminants to native wildlife. Studies on contaminant threats would be designed to minimize impact upon listed species and native habitats. Periodic removal of trash and debris that smothers salt marsh habitats would restore the quality of habitat for the endangered light-footed clapper rail. In addition, removal of trash and debris from the beach may improve the quality of the nesting sites for the endangered California least tern and threatened western snowy plover (though some debris may provide escape cover for tern and plover chicks).

4.1.3 Effects on the Social and Economic Environment from Increased Wildlife Management Programs

Abundant populations of native wildlife, increasing populations of endangered and threatened species, and high quality native habitats would increase the attractiveness of wildlife-oriented community festivals (such as National Wildlife Refuge Week and Imperial Beach Birding Festival) and would support the growth of ecotourism (such as bird-watching tours). These festivals and other ecotourism opportunities would increase sales tax and transient occupancy tax revenues to the City of Imperial Beach and would broaden the City's tourism base and appeal.

4.1.4 Effects on Archaeological and Historical Resources from Increased Wildlife Management Programs

Implementation of increased wildlife management actions is not expected to adversely effect archaeological and historical resources. These management actions would not result in any disturbances to the ground or excavation of potential archaeological and historical sites.

4.1.5 Effects on the Physical Environment from Increased Visitor Services

Providing increased visitor services would have only minor impacts upon the physical environment of the Tijuana Slough Refuge. Implementing new environmental education and interpretive programs, providing wildlife-dependent recreation (environmental education, interpretation, wildlife observation, wildlife photography, and fishing along the beachfront), integrating biological and water quality monitoring with environmental education, and installing new signs and displays would have little to no impact upon the physical environment of the Tijuana Slough Refuge. As in the wildlife management program, none of these visitor services would increase soil erosion, degrade coastal water quality, or alter the topography or landforms of the Tijuana Slough Refuge.

Constructing new wildlife observation and photography blind(s) and enhancing certain existing trails to increase accessibility and environmental educational opportunities would have minor impacts upon the physical environment because only the existing trail footprint would be improved, trail improvements would represent only minor incremental changes to current uses, and observation blind(s) would be constructed in previously disturbed areas (such as existing viewing areas). Improvements to the existing trails and construction of observation blinds would not result in any new adverse impacts to coastal water quality or increase soil erosion.

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Constructing a new trail that links Grove Avenue and the trailhead at Fifth Street and Iris Avenue, would have limited impacts to the physical environment. Improving this trail would generate minor potential impacts to water quality from soil erosion during trail construction. After construction, trail improvements may improve water quality by reducing trespass and public use in more erodible and sensitive areas. This would be accomplished by replacing the more easily erodible soil surface with a crushed rock trail surface, and by properly designing the trail to control erosion and runoff.

The Service would continue to maintain Refuge trails, to support wildlife-dependent recreation and to maintain the quality of the hiking and horseback riding experiences. Improving the trails may improve water quality and reduce soil erosion by: (1) controlling trespass and public use in more erodible and sensitive areas; (2) lowering the grade of the trails; (3) installing erosion resistant trail surfaces (crushed rock); (4) relocating trails that are subject to periodic flooding and erosion; and (5) by constructing water bars and other erosion control measures.

4.1.6 Effects on the Biological Environment from Increased Visitor Services

New and expanded visitor services would be designed to avoid and minimize potential adverse impacts to the biological resources of the Tijuana Slough Refuge. Constructing new wildlife observation and photography blind(s) and enhancing certain existing trails to increase accessibility and environmental educational opportunities would have minimal impacts upon the biological environment because only the existing trail footprint would be improved, trail improvements would represent only minor incremental changes to current uses, and observation blind(s) would be constructed in previously disturbed areas (such as existing viewing areas).

The construction of a new trail linking Grove Avenue to the Fifth Street and Iris Avenue kiosk is expected to have minor impacts on biological resources of the Tijuana Slough Refuge. The proposed Grove Avenue trail link is an existing undeveloped trail that traverses a transition zone of salt marsh and coastal sage scrub vegetation communities (Zedler, Nordby, and Kus 1992). The proposed trail is in upland habitats except for a crossing over a drainage ditch. The endangered light-footed clapper rail has been observed along the drainage ditch near the proposed trailhead on Grove Avenue. Physical improvements to and increased use of this trail would have minor impacts to the endangered light-footed clapper rail since this undeveloped trail is already heavily used by the public and habitats for this species would not be modified.

4.1.7 Effects on the Social and Economic Environment from Increased Visitor Services

Increased authorized public use of the trail linking Grove Avenue to the Service's kiosk on Fifth Street and Iris Avenue would be expected to increase visitor enjoyment of the Refuge. However, this new trail may increase traffic and visitor use in the vicinity of the neighboring housing area.

4.1.8 Effects on Archaeological and Historical Resources from Increased Visitor Services

Implementing new environmental education and interpretive programs; providing wildlife observation, wildlife photography, and fishing along the beachfront; integrating biological and water quality monitoring with environmental education; and installing new signs and displays, would have little to no impact upon the archaeological and historical resources of the Tijuana Slough Refuge.

Constructing new wildlife observation and photography blind(s) and enhancing certain existing trails to increase accessibility and environmental educational opportunities is not expected to impact archaeological and historical resources because only the existing trail footprint would be improved, trail improvements would represent only minor incremental changes to current uses, and observation blind(s) would be constructed in previously disturbed areas (such as existing viewing areas).

Constructing a new trail that links Grove Avenue and the Fifth Street and Iris Avenue trailhead may have the potential to impact archaeological and historical resources by trail construction. No studies have identified archaeological resources along the trail alignment and future studies may be needed. Future trail construction activities undertaken by the Service that would affect archaeological and historic resources would remain subject to consultation with the State Historic Preservation Officer pursuant to Section 106 of the National Historic Preservation Act.

4.1.9 Effects on the Physical Environment from Increased Control of Invasive Weeds

Increased efforts to control invasive weeds throughout the Refuge may result in minor increases in erosion and runoff. Bare patches of soil caused by removal of exotic plants may be more susceptible to soil erosion, but this impact would be minimized by the concurrent effort to restore native vegetation to the affected areas and selective use of systemic herbicides. Use of mowers and weed trimmers would leave a low stubble of vegetation that may control soil erosion. Experimental use of salt to control non-native salt-intolerant weeds would be monitored so that salt levels in the soil do not result in bare areas that cannot be recolonized by native species.

4.1.10 Effects on the Biological Environment from Increased Control of Invasive Weeds

Invasive weed control may adversely impact rare plants and native plant communities by accidental hand removal, mowing, and herbicide drift. The target weeds are not similar in appearance to listed species and other rare plants so accidental removal by hand is not expected to be a major problem. Impacts to native plants would be avoided and minimized by using hand removal, spot herbicide treatment of problem infestations, and herbicide "cut and paint" techniques on cut stumps. Listed plants (such as the endangered salt marsh bird's beak) would be flagged by Service biologists and herbicide treatment would not occur within the vicinity of these rare plants or vernal pools. Approved herbicides would be used by trained personnel to control invasive weeds. Based on recent research, application of salt may be used to control exotic plants at street drains and sewage spill locations. The removal of non-native invasive weeds is expected to have a net benefit for endangered and threatened species by reducing competition and displacement of native plant communities.

4.1.11 Effects on the Social and Economic Environment from Increased Control of Invasive Weeds

Increased control of invasive weeds would have no effect on the social and economic environment.

4.1.12 Effects on Archaeological and Historical Resources from Increased Control of Invasive Weeds

Increased control of invasive weeds is not expected to adversely affect archaeological and historical resources. These management actions would not result in any disturbances to the ground or excavation of potential archaeological and historical sites.

4.2 Environmental Consequences of Implementing Alternative B (No Action Alternative). Implement Refuge Comprehensive Management Plan to Provide Existing Levels of Wildlife Management and Visitor Services.

4.2.1 Effects on the Physical Environment from Existing Wildlife Management Programs

Maintaining the existing wildlife management programs would have little to no impact upon the physical environment of the Tijuana Slough Refuge. Monitoring endangered, threatened, rare, and migratory species; implementing key recovery actions for endangered and threatened species; providing law enforcement to control trespass through sensitive habitats; and evaluating contaminant threats and sites would not increase soil erosion, degrade coastal water quality, or alter the topography or landforms of the Tijuana Slough Refuge. The physical condition of the beach and tidal exchange in Oneonta Slough would be slightly improved by the intermittent removal of trash and debris.

4.2.2 Effects on the Biological Environment from Existing Wildlife Management Programs

Maintaining existing wildlife management programs would have positive impacts on the biological environment of the Tijuana Slough Refuge, but at a lesser level relative to Alternative A (Preferred Alternative). Monitoring for endangered, threatened, rare, and migratory species would provide information on species status, habitat condition, and population trends. Implementing certain recovery actions for endangered and threatened species would forestall the extinction of listed species and conserve native biological diversity.

Providing law enforcement to control trespass through sensitive habitats would reduce disturbances to listed species and maintain the quality of habitats. Evaluating contaminant threats and sites would provide information on the potential exposure and pathways of contaminants to native wildlife. Studies on contaminant threats would be designed to minimize impact upon listed species and native habitats. Intermittent removal of trash and debris that smothers salt marsh habitats would restore the quality of habitat for the endangered light-footed clapper rail. In addition, removal of trash and debris from the beach may improve the quality of the nesting sites for the endangered California least tern and threatened western snowy plover (though some debris may provide escape cover for tern and plover chicks).

4.2.3 Effects on the Social and Economic Environment from Existing Wildlife Management Programs

There would be little to no change to the existing social and economic environment under Alternative B. The proposed new Grove Avenue trail would not be improved and there would be no expected increase in visitor use of the existing trail. Visitors would lose an opportunity to walk from the Visitor Center to the Tijuana River in a continuous improved trail.

4.2.4 Effects on Archaeological and Historical Resources from Existing Wildlife Management Programs

Implementation of existing wildlife management actions is not expected to adversely effect archaeological and historical resources. These management actions would not result in any disturbances to the ground or excavation of potential archaeological and historical sites.

4.2.5 Effects on the Physical Environment from Existing Visitor Services

Providing current levels of visitor services environmental education, interpretation, wildlife observation, wildlife photography, fishing along the beachfront, installing new signs and displays, and maintaining and improving existing trails would have little to no impact upon the physical environment of the Tijuana Slough Refuge. Providing these existing visitor services would not increase soil erosion, degrade coastal water quality, or alter the topography or landforms of the Tijuana Slough Refuge.

The proposed Grove Avenue trail link would not be improved to meet Refuge and American With Disabilities Act standards. Environmental impacts related to the construction of the improved trail and blind(s) would be avoided. However, the public would likely continue to use this undeveloped trail. Structural improvements to control erosion and drainage at the proposed Grove Avenue trail link would not occur and the surrounding physical environment would continue to degrade from continued public use of the undeveloped trail. Wildlife observation and photography blind(s) would not be constructed.

The Service would continue to provide Refuge trail maintenance to support wildlife-dependent recreation and to maintain the quality of the hiking and horseback riding experiences. Trail improvements may improve water quality and reduce soil erosion by controlling trespass and public use into more erodible and sensitive areas, by lowering the grade of trails, by installing erosion resistant trail surfaces (crushed rock), by relocating trails that are subject to periodic flooding and erosion, and by constructing water bars and other erosion control measures.

4.2.6 Effects on the Biological Environment from Existing Visitor Services

Providing current levels of environmental education, interpretation, wildlife observation, wildlife photography, and fishing along the beachfront, installing new signs and displays, and maintaining and improving existing trails would have little to no impact upon the biological environment of the Tijuana Slough Refuge. Biological impacts related to the construction of the Grove Avenue trail link and wildlife observation and photography blind(s) would be avoided. However, minor disturbances to the endangered light-footed clapper rail would continue because the public would likely continue to use the undeveloped trail at Grove Avenue.

4.2.7 Effects on the Social and Economic Environment from Existing Visitor Services

There would be little to no change to the existing social and economic environment under Alternative B. The proposed new Grove Avenue trail would not be improved and there would be no expected increase in visitor use of the existing trail. Visitors would lose an opportunity to walk from the Visitor Center to the Tijuana River in a continuous improved trail.

4.2.8 Effects on Archaeological and Historical Resources from Existing Visitor Services

Implementation of existing wildlife management actions is not expected to adversely affect archaeological and historical resources. These management actions would not result in any disturbances to the ground or excavation of potential archaeological and historical sites.

4.2.9 Effects on the Physical Environment from Existing Efforts to Control Invasive Weeds

Existing efforts to control invasive weeds throughout the Refuge may result in minor increases in erosion and runoff. Bare patches of soil caused by the removal of exotic plants may be more susceptible to soil erosion, but this impact would be minimized by the concurrent effort to restore native vegetation to the affected areas and selective use of systemic herbicides. Use of mowers and weed trimmers would leave a low stubble of vegetation that may control soil erosion. Experimental use of salt to control salt-intolerant weeds would be monitored so that salt levels in the soil do not result in bare areas that cannot be recolonized by native species.

4.2.10 Effects on the Biological Environment from Existing Efforts to Control Invasive Weeds

Weed control would continue at current levels using existing staff and funding. The current program is sporadic and relies heavily on volunteers to remove invasive weeds. However, this level of effort is not sufficient to stem the expansion of invasive non-native weeds. The biological integrity of native plant communities would diminish as invasive weeds spread and crowd out native plants.

4.2.11 Effects on the Social and Economic Environment from Existing Efforts to Control Invasive Weeds

There would be no impact to the social and economic environment from the existing efforts to control invasive weeds.

4.2.12 Effects on Archaeological and Historical Resources from Existing Efforts to Control Invasive Weeds

There would be no impact to archaeological and historical resources from the existing efforts to control invasive weeds. These management actions would not result in any disturbances to the ground or excavation of potential archaeological and historical sites.

4.3 Environmental Consequences Common to All Alternatives From Emergency Dredging, Sand Dune Maintenance, Predator Management, Acquisition of Additional Lands, Construction of New Facilities, and Relocation of Damaged Trails.

4.3.1 Effects on the Physical Environment from Emergency Dredging

Under Alternatives A and B, the Service would implement emergency dredging of the mouths of Oneonta Slough and Tijuana River in the event that these tidal channels are blocked by sand carried by storm waves. The proposed action would have a beneficial impact upon the physical environment of the Tijuana Estuary by restoring tidal flushing and tidal exchange and redistributing sand from the tidal channels to the barrier beach. The net effect of the emergency dredging would be restoring the physical condition of the tidal channels to the conditions existing prior to the storm wave damage. Increased turbidity could occur over the short-term in the estuarine channels and coastal waters. The California Coastal Commission has concurred with the Service's determination that the proposed emergency action would not adversely affect coastal zone resources.

4.3.2 Effects on the Biological Environment from Emergency Dredging

Emergency dredging would result in temporary disturbances to wildlife in the vicinity of mouths of Oneonta Slough and the Tijuana River from the operation of construction equipment and increased human activity. These impacts are expected to end upon completion of the emergency dredging. Shorebirds and seabirds would be temporarily displaced to neighboring undisturbed areas of the estuary and shoreline. Dune vegetation may get crushed by heavy equipment or covered by sand during the dredging. Mitigation measures to minimize impacts related to the dredging are listed below.

The biological impacts resulting from the emergency dredging are dwarfed by the adverse impacts that would result to the Tijuana Estuary if the emergency dredging was not implemented. For example, the 1984 closure of the Tijuana River mouth resulted in the estuary becoming hypersaline and a major dieback of salt marsh vegetation. The endangered light-footed clapper rail was nearly extirpated from the river mouth closure in 1984.

In the event that emergency dredging is needed, the following conditions would apply to minimize any impacts to biological resources (including endangered species):

- All dredging work will be supervised by a Refuge biologist.
- Dredging will be scheduled to avoid the nesting season for the endangered California least tern and threatened western snowy plover, if possible. In the event that the mouths of the Tijuana River and/or Oneonta Slough close during the nesting season for these species, Refuge biologists will survey the project area to ensure that no nests will be impacted by the dredging.
- Locations of the endangered salt marsh bird's beak will be identified by a Refuge biologist prior to any dredging. Locations of the endangered salt marsh bird's beak would be flagged by Service biologists and the dredging contractor would be required to avoid these listed plants.
- Dredging work will be limited to the mouths of the Tijuana River and Oneonta Slough that were blocked by sand movement from recent storms.
- All sand spoils will be deposited above the mean high water tide level on the beach and graded with a bulldozer.
- No sand spoils will be deposited on dune or wetland vegetation.

4.3.3 Effects on the Social and Economic Environment from Emergency Dredging

The proposed emergency dredging would have no impact on the social and economic environment.

4.3.4 Effects on Archaeological and Historical Resources from Emergency Dredging

The proposed emergency dredging would have no impact on the social and economic environment.

4.3.5 Effects on the Physical Environment from Annual Sand Dune Maintenance

Approximately 5,280 cubic yards of sand from the mouth of the Tijuana River to the southern terminus of Sea Coast Drive would be moved from the beach slope to rebuild the barrier dunes. Sand dune maintenance involves the use of heavy equipment to rebuild the coastal dunes. Sand is pushed up onto the dunes from the beach slope and the physical appearance of this short section of beach is modified. Work is conducted during low tides and there is little impact to water quality from construction activities.

4.3.6 Effects on the Biological Environment from Annual Sand Dune Maintenance

The annual sand dune maintenance would decrease the likelihood that Oneonta Slough and Tijuana River would be blocked by sand from seasonal storms. This added level of maintenance would protect the biological resources of the northern arm of the Tijuana Estuary, including a significant population of the endangered light-footed clapper rail. Minor impacts from smothering sand dune plants may occur from construction activities. The maintenance of the sand dunes is scheduled to avoid the nesting season for the endangered least tern and threatened western snowy plover.

4.3.7 Effects on the Physical Environment from Increased Predator Management

Implementation of the predator management program would have negligible impacts on the physical environment.

4.3.8 Effects on the Biological Environment from Increased Predator Management

The goal of the predator management program is the recovery of several endangered, threatened, and rare species, such as the endangered California least tern, threatened western snowy plover, endangered least Bell's vireo, and endangered light-footed clapper rail. Without effective predator management, large continual losses of eggs, chicks, and adults of the California least tern, light-footed clapper rail, and western snowy plover would threaten the recovery of these listed species. Reducing predation of endangered, threatened, and rare species by feral cats, feral dogs, and other individual mammalian predators would increase the recovery potential of several listed species such as the California least tern, western snowy plover, and light-footed clapper rail. Recovery goals for endangered and threatened species at the Tijuana Slough Refuge are likely to be met with increased predator management. Effective predator management is expected to sustain the nesting population, increase the survival rate of eggs and chicks, and improve the fledgling success rate of these listed species.

There would be a localized reduction in feral cats, feral dogs, and certain problem mammalian predators (such as red fox, racoon, and opossum) on Refuge lands. Raptor species requiring management because of conflicts with endangered species would be impacted slightly by the removal of a few problem individuals. A relatively small number of native avian predators that have been identified as repeatedly preying on eggs, chicks, and nesting adults of endangered and threatened species may be trapped, relocated, shot, or euthanized. This may result in a small localized reduction in the number of native raptors within Refuge lands, depending upon the location of the release site for trapped raptors. Cowbird trapping would decrease brown-headed cowbird populations on Refuge lands. Implementation of increased predator management would not have a major effect on the overall population levels of any target species.

The management of predators at the Tijuana Slough Refuge is not expected to cause a major growth in rodent populations. Within both the Tijuana Slough Refuge and Tijuana River National Estuarine Research Reserve, diverse and abundant populations of raptors and mammalian predators are present. Limited seasonal reduction in mammalian and avian predators is not expected to result in the release of explosive population growth of rodents (U.S. Fish and Wildlife Service and U.S. Navy 1990, Guthery and Beasom 1977, Schmidt 1986, and Soule *et al.* 1988).

Impacts to target predator species would be minimized by ensuring that predator management is conducted in a scientifically sound and humane manner. The predator management program would be implemented with the following conditions (see also Comprehensive Conservation Plan, Chapter 5: Resource Protection, Management, and Restoration):

- Only licensed and authorized agencies and private organizations would implement predator management actions. These agencies may include the Service; U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services; County Animal Control Department; and private organizations.

- Live-trapping will be the principal method for capturing problem predators. All captured dogs, cats, and other feral pets will be taken to the local animal shelter for recovery and adoption opportunities.

- All traps will be regularly checked. Every effort will be made to avoid and minimize collection of non-target native wildlife. Non-target wildlife will be released on-site to the maximum extent possible.

- Problem predators that cannot be relocated will be euthanized, using approved humane methods.

The Service would not implement public recreational hunting or commercial trapping to manage predators that are limiting the recovery of endangered and threatened species within the Tijuana Slough Refuge.

The potential use of approved toxicants to manage predators within the Tijuana Slough Refuge is highly limited. Rodenticides may be used under specific circumstances to control Norway rats or California ground squirrels in sensitive habitat areas (such as in nesting areas for the California least tern) or to protect public health and safety. Opportunities to use toxicants are limited because the application is not species specific, the toxicants may be hazardous in the environment, and the use may result in secondary mortality of a non-target species.

4.3.9 Effects on the Social and Economic Environment from Increased Predator Management

The general public would benefit by knowing that endangered and threatened species and their habitats were being managed and protected. The local community would benefit due to reduced presence of feral dogs and feral cats in neighborhoods and the reduced potential for adverse contact and disease transmission. Outbreaks of diseases which are fairly common among high populations of mammalian predators (such as rabies, parvovirus, sarcoptic mange, and canine distemper), would be less likely to occur as feral animal populations are reduced (U.S. Fish and Wildlife Service and U.S. Navy 1990).

4.3.10 Effects on the Archaeological and Historical Resources from Increased Predator Management

Implementation of the predator management program would have negligible impacts on archaeological and historical resources.

4.3.11 Effects on the Physical Environment from the Acquisition of Additional Lands Along Sea Coast Drive

In the short-term, the Napolitano tract would remain undisturbed and no impacts to the physical environment would occur. However, the long-term plan is to remove the fill and restore the site to tidal salt marsh habitat. Removal of the fill would result in temporary impacts to water quality in the northern arm of Oneonta Slough. There would be a temporary potential increase in soil erosion as the fill material is being removed. The fill would be removed to below grade to allow tidal exchange. Tidal flushing and exchange in Oneonta Slough may slightly increase as a result of the removal of the fill.

4.3.12 Effects on the Biological Environment from the Acquisition of Additional Lands Along Sea Coast Drive

In the short-term, the Napolitano tract would remain undisturbed and no impacts to biological resources would occur. The removal of the fill would increase the amount of salt marsh habitat for the endangered light-footed clapper rail in the Refuge. Creation of salt marsh and tidal channels would benefit several other species of birds, fish, and invertebrates.

4.3.13 Effects on the Social and Economic Environment from the Acquisition of Additional Lands Along Sea Coast Drive

Transfer of the 1.25-acre Napolitano tract would have no impact on property tax revenues under Alternatives A and B because the parcel was previously acquired by the City of Imperial Beach as open space. Residents in the surrounding neighborhood would enjoy unobstructed views of the Tijuana Estuary from Sea Coast Drive.

4.3.14 Effects on the Archaeological and Historical Resources from Acquisition of Additional Lands Along Sea Coast Drive

Implementation of the predator management program would have negligible impacts on archaeological and historical resources.

4.3.15 Construction of New Offices and Classroom by the California Department of Parks and Recreation on Lands Under Easement to the State of California

Design and construction of any new visitor and support facilities under Alternatives A and B, would follow policies and conditions identified in the Refuge Comprehensive Management Plan to avoid and minimize potential adverse environmental impacts (see Comprehensive Management Plan, Chapter Eight: Public Access, Involvement, and Use Plan, Section III. Policies and Section IV. Existing Conditions and Perceived Needs; and Chapter Nine: Facilities Plan - Buildings, Trails, and Roads, Section III. Policies). Construction of new facilities generally would be sited outside any sensitive habitats and would be planned with the involvement of neighbors and interested community groups.

4.3.16 Effects on the Physical Environment from Construction of New Offices and a Classroom by the California Department of Parks and Recreation on Easement Lands

The California Department of Parks and Recreation would construct new offices and a classroom/community room on lands under an existing easement to the State of California. The proposed additions of new office space and a classroom/community room are expected to have minimal impact on the physical environment of the Tijuana Slough Refuge because,

(1) the sites have been heavily disturbed prior to acquisition and subsequently by the construction of the visitor center, garage, and parking lot, (2) the sites are located outside of any sensitive habitats, (3) the sites are adjacent to public vehicular access, (4) site preparation would require only minimal grading, and (5) impacts to views from the adjacent apartment buildings would be minimal because the facilities would be constructed within the existing garage structure.

4.3.17 Effects on the Biological Environment from Construction of New Offices and Classroom by the California Department of Parks and Recreation on Easement Lands

The proposed construction of new offices and a classroom would have minor biological impacts. The areas proposed for future construction have been previously disturbed by grading, dumping, and vehicular traffic prior to Refuge acquisition and by construction of the visitor center and parking lot. Proposed sites are located outside of any sensitive habitats, and would require only minimal earthwork and grading. No endangered, threatened, or rare species or sensitive habitats would be affected by the proposed construction.

4.3.18 Effects on the Social and Economic Environment from the Construction of New Offices and Classroom by the California Department of Parks and Recreation on Easement Lands

There may be localized increased spending for building supplies and materials as a result of the construction of the new offices and classroom. The new facilities would increase educational opportunities for local schools.

4.3.19 Effects on the Archaeological and Historical Resources from the Construction of New Offices and a Classroom by the California Department of Parks and Recreation on Easement Lands

Development of proposed office and classroom space would be in an area previously disturbed by construction of the visitor center, garage, and parking lot. Future construction activities undertaken by the Service that would affect archaeological and historic resources would remain subject to consultation with the State Historic Preservation Officer pursuant to Section 106 of the National Historic Preservation Act.

4.3.20 Effects on the Physical Environment from the Relocation of Damaged Trails in the Tijuana River Floodplain

The relocation of certain flood-prone trails to nearby existing trails would improve the physical environment by reducing trail erosion during flooding and allowing riparian vegetation to grow back within the abandoned trail.

4.3.21 Effects on the Biological Environment from the Relocation of Damaged Equestrian Trails in the Tijuana River Floodplain

Relocation of certain trails damaged by periodic flooding and erosion in the Tijuana River floodplain would benefit the biological resources of the Tijuana Slough Refuge. Relocation of flood-damaged trails would (1) reduce erosion and transport of sediments to downstream wetlands, (2) allow riparian vegetation to grow back within the abandoned trail, and (3) redirect trail use away from the riparian zone and nesting habitat for the endangered Least bell's vireo and southwestern willow flycatcher.

4.3.22 Effects on the Social and Economic Environment from the Relocation of Damaged Equestrian Trails in the Tijuana River Floodplain

Relocation of flood-damaged trails to nearby less flood-prone alignments would continue to provide public access to trails, minimize maintenance costs, and protect public health and safety. By relocating certain alignments, recreational and commercial equestrian use of Refuge trails would be uninterrupted by the periodic flooding of the Tijuana River valley.

4.3.23 Effects on the Archaeological and Historical Resources from the Relocation of Damaged Equestrian Trails in the Tijuana River Floodplain

Flood-prone trails would be relocated to existing trails. Short sections of new trail may be necessary depending on the location and availability. Impacts to archaeological and historical resources from new trail construction would be evaluated pursuant to Section 106 of the National Historic Preservation Act.

4.4 Unavoidable Adverse Impacts and Irreversible and Irretrievable Commitments of Resources

Emergency dredging of the mouths of Oneonta Slough and Tijuana River would result in short term unavoidable adverse impacts to water quality. However, these limited adverse impacts are offset by the need to maintain tidal flushing and to protect the ecological health of the Tijuana Estuary. Predator management would result in small localized unavoidable impacts to certain individual predators. However, failure to implement an effective predator management program would result in adverse losses of endangered and threatened species.

Funds, time, and petroleum fuels needed to implement the Refuge Comprehensive Management Plan represent an irreversible and irretrievable commitment of resources.

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4.5 Short-term Uses Versus Long-term Productivity

Implementation of either Alternatives A or B would not reduce long-term productivity for short-term uses. In fact, one of the purposes of the Comprehensive Management Plan is to insure the long-term biological productivity of the Tijuana Estuary while providing a variety of other activities and uses within the Tijuana Slough Refuge.

4.6 Cumulative Impacts

Implementation of the Comprehensive Management Plan would have beneficial cumulative impacts to the ecological integrity of the Tijuana Estuary by integrating management actions among the resource agencies, increasing bi-national coordination within the Tijuana River watershed, increasing the potential for recovering endangered and threatened species, and maintaining the biological diversity of the Tijuana Slough Refuge. However, the cumulative benefits are greater under Alternative A relative to Alternative B. Implementation of the different elements of the Comprehensive Management Plan would not result in incremental adverse impacts to the physical, biological, social and economic, and archaeological and historical environments.

Chapter 5.COORDINATION, CONSULTATION, AND COMPLIANCE

5.1 Agency Coordination and Public Involvement

The Comprehensive Management Plan was prepared using a consensus-based planning process involving representatives from the National Oceanic and Atmospheric Administration, U.S. Fish and Wildlife Service, California Department of Parks and Recreation, California Coastal Commission, California Coastal Conservancy, San Diego County Department of Parks and Recreation, City of Imperial Beach, City of San Diego, community groups, and citizens. Preparation of this plan was discussed throughout 1997 in open public meetings involving the Tijuana River Management Authority, community groups, and citizens. The first public comment period on the draft Comprehensive Management Plan was open from December 8, 1997 to January 26, 1998. A public meeting to discuss and to receive comments on the Comprehensive Management Plan was held on December 9, 1998, in the City of Imperial Beach. Approximately 22 members of the public attended the December 1998 workshop. In addition, much of the Comprehensive Management Plan incorporates the existing Tijuana River National Estuarine Sanctuary Management Plan. The 1986 Management Plan was subject to extensive agency and public review.

5.2 Environmental Review and Coordination

5.2.1 National Environmental Policy Act

As a Federal agency, the Service must comply with provisions of the National Environmental Policy Act. An environmental assessment is required under the National Environmental Policy Act to evaluate reasonable alternatives that will meet stated objectives and to assess the possible impacts to the human environment. The environmental assessment serves as the basis for determining whether implementation of the proposed action would constitute a major Federal action significantly affecting the quality of the human environment.

5.2.2 Other Federal Laws, Regulations, and Executive Orders

In adopting and implementing the Comprehensive Management Plan for the Tijuana Slough Refuge, the Service would comply with a number of Federal laws, regulations, and executive orders including the following: National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997; Coastal Zone Management Act of 1972, as amended; Endangered Species Act of 1973, as amended; National Historic Preservation Act of 1966, as amended; Intergovernmental Review of Federal Programs (Executive Order 12372); Protection of Wetlands (Executive Order 11990); Floodplain Management (Executive Order 11988); and Management and General Public Use of the National Wildlife Refuge System (Executive Order 12996).

5.2.3 Distribution and Availability

The Environmental Assessment was sent to various agencies, organizations, community groups, and individuals for review and comment (see Appendix A). Comments will be considered and addressed in the final Environmental Assessment.

Chapter 6. LIST OF PREPARERS AND REVIEWERS

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Acknowledgements

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References Cited

Affinis. 1991. Cultural Resources Inventory for the Tijuana Estuary Enhancement Model Project, Tijuana River Valley, San Diego, California.

California Coastal Commission, U.S. Department of Commerce, and Tijuana River National Estuarine Sanctuary Management Authority. 1986. Tijuana River National Estuarine Sanctuary Management Plan.

California Coastal Conservancy and U.S. Fish and Wildlife Service. 1993. Final Environmental Impact Report/Environmental Impact Statement for the Tijuana Estuary Tidal Restoration Program. Prepared by ENTRIX and Pacific Estuarine Research Laboratory.

California Department of Parks and Recreation. 1974. Border Field State Park Resource Management Plan and General Development Plan.

California State Polytechnic University, Pomona. 1989. A Management Framework for the Tijuana River Valley. Prepared for the County of San Diego.

City of San Diego. 1981. Border Highlands Land Use Plan.

Guthery, F.S. and S.L Beasom. 1977. Responses of game and nongame wildlife to predator control in south Texas. J. Range Manage. 36:404-409.

San Diego Association of Governments. 1995. SANDAG INFO. January 1, 1995 Population and Housing Estimates.

Schmidt, R.H. 1986. Community-level effects of coyote population reduction. pp. 49-65, in Community Toxicity Testing, J. Cairnes, Jr. ed. Amer. Soc. Testing Materials Spec. Tech. Publ. 920:1-350.

Soule, M.E., D.T. Bolger, A.C. Alberts, J. Wright, M. Sorice, and S. Hill. 1988. Reconstructed dynamics of rapid extinctions of chaparral-requiring birds in urban habitat islands. Conserv. Biol. 2(1):75-91.

U.S. Department of Commerce and California Coastal Commission. 1981. Final Environmental Impact Statement for the Proposed Estuarine Sanctuary Grant Award to the State of California for a Tijuana River National Estuarine Sanctuary.

U.S. Fish and Wildlife Service. 1985. Recovery Plan for the California Least Tern, *Sterna antillarum brownii*. U.S. Fish and Wildlife Service, Portland, Oregon. 112 pp.

U.S. Fish and Wildlife Service. 1985. Recovery Plan for the Light-footed Clapper Rail. U.S. Fish and Wildlife Service, Portland, Oregon. 121 pp.

U.S. Fish and Wildlife Service. 1988. Draft Recovery Plan for the Least Bell's Vireo. U.S. Fish and Wildlife Service, Portland, Oregon. 139 pp.

U.S. Fish and Wildlife Service. 1988. Draft Recovery Plan for the Vernal Pools of Southern California. U.S. Fish and Wildlife Service, Portland, Oregon. 139 pp.

U.S. Fish and Wildlife Service and U.S. Navy. 1990. Final Environmental Impact Statement for Endangered Species Management and Protection Plan, Naval Weapons Station-Seal Beach and Seal Beach National Wildlife Refuge.

U.S. Fish and Wildlife Service. 1999. Comprehensive Management Plan for the Tijuana Slough National Wildlife Refuge. U.S. Fish and Wildlife Service, Carlsbad, California. 305 pp.

Wilbur, S.R. 1974. The status of the light-footed clapper rail. American Birds 28(5):868-870.

Zedler, J.B., C.S. Nordby, and B.E. Kus. 1992. The Ecology of Tijuana Estuary, California: A National Estuarine Research Reserve. NOAA Office of Coastal Resource Management, Sanctuaries and Reserves Division, Washington, D.C.

Appendix A. Distribution List

Elected Officials

Alpert	Senator Dede	U.S. Senator Alpert's Office	ATTN: Mary Anne McCarthy
Boxer	Barbara	U.S. Senate	
Feinstein	Dianne	U.S. Senate	
Bilbray	Brian	U.S. House Of Representatives	ATTN: Freddy Tayee
Filner	Bob	U.S. House Of Representatives	
Ducheny	Denise Moreno	State of California	Assemblywoman
Vargas	Juan	City of San Diego	City Council District 8

Federal

Jacobson	Edie	U.S. Navy	SW Division
Fischer	Charles	U.S. International Boundary & Water Comm.	
Aspland	Trish	U.S. Fish and Wildlife Service	Division of Refuge Management
Kenney	Martin	U.S. Fish and Wildlife Service	
Rundle	Dean	U.S. Fish and Wildlife Service	
Young	Rebecca	U.S. Fish and Wildlife Service	
Doolittle	Supv. William "Dee"	U.S. Fish and Wildlife Service	
Garfield	NINA	U.S. Border Patrol	
Larson	JAN	NOAA ERO Headquarters	
		NAS North Island	Natural Resource Management Bra

State

Jenkins	Phil	TRNERR/DPR	
Stewart	Theresa	Dept of Fish and Game	
Navarro	ED	California Dept of Parks and Recreation	
King	Jim	California Coastal Conservancy	
McEache	Lee	California Coastal Comm.	

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City

Anderson	Christian	City of San Diego	Real Estate Assets Dept.
Boekamp	Patty	City of San Diego	Transportation and Drainage Desig
Lovewell	Jim	City of San Diego	Real Estate Assets Dept.
Rolf	Lee	City of San Diego	
		City of Imerial Beach	Community Development Director
Johnson	Barry	City of Imerial Beach	Office of the City Manager
Murphy	Pat	City of Imerial Beach	Planning Department

County

Letter	Art	Tijuana Valley County Water District	
Ketcham	Horace	County of San Diego	Vector Control
Martinez	ALEX	County of San Diego	Dept. of Parks and Recreation
Respasy	RIC	County of San Diego	Dept. of Parks and Recreation

Libraries

		San Diego Public Library	ATTN: Science/Documents
		Library Services	
		Imperial Beach Public Library	
		Coronado Public Library	ATTN: Anne Clifford
		Chula Vista Public Library	ATTN: Marie Anton

Organizations

Byrne	Robert	Wildlife Managment Institute	
Sparrowe	Rollin D.	Wildlife Management Institute	

Organizations

Horn	Bill	Wildlife Legislative Fund of America	
Quevli	Beth	Wildlife Legislative Fund of America	
Richardson	Tim	Wildlife Forever	
Moyer	Steve	Trouts Unlimited	
Franklin	Tom	The Wildlife Society	
Goldstein	Ed	The Wilderness Society	
Waltman	Jim	The Wilderness Society	
Mosher	Jim	The Izaak Walton League of America	
Gable	Melinda	The Congressional Sportsmen's Foundation	
Hogan	Matt	The Congressional Sportsmen's Foundation	
Brauning	Beverly	TRVEA	
Parsons	Rick	Safari Club International	
McCoy	Patricia	SWIA	
Mazzoni	Joe	National Wildlife Refuge Association	
Tobin	David	National Wildlife Refuge Assn	
Inkley	Doug	National Wildlife Federation	
Lamson	Susan	National Rifle Assn of America	
Kania	Gary	National Fish and Wildlife Foundation	
Sigmon	Neal	National Fish and Wildlife Foundation	
Sibbing	Julie	National Aududon Society	
Cannon	Charlie	National Audubon Society	
Lovett	Mark	National Audubon Society	
Taylor	Gary	International Assn of Fish and Wildlife Agenci	
Sutherland	Scott	Ducks Unlimited	
Beetham	Mary Beth	Defenders of Wildlife	
		Cooperative Alliance for Refuge Enhancemen	
Gomez	David	Citizens Revolting Against	
Powers	Carolyn	Citizens Against Recreational Eviction	
Cannon	Charlie	Cannon Consultants, Inc.	
		CONCUR	
Hayden	Mike	American Sportfishing Assn	
Kendall	Robert	American Fisheries Society	

Universities/Colleges

[redacted]	[redacted]	[redacted]	[redacted]
Miller	Karen	SDSU Biological Field Station	Biological Field Station

Individuals

[redacted]	[redacted]	[redacted]	[redacted]
McCoy	Mike		
Zedler	Jay		

Appendix B. Biological Monitoring and Recovery Actions at the Tijuana Slough National Wildlife Refuge.

Biological monitoring for endangered, threatened, and rare species and avian and mammalian predators would be increased above existing levels (Alternative B). Surveys for the endangered California least tern, threatened western snowy plover, endangered light-footed clapper rail, endangered least Bell's vireo, endangered southwestern willow flycatcher, endangered salt marsh bird's beak, State-endangered Belding's savannah sparrow, and other rare species would be conducted regularly, particularly during the breeding seasons of these species. Surveys of migratory shorebirds and seabirds would be conducted. Populations of plants and invertebrates endemic to vernal pools and pool hydrology would be monitored. Predator abundance would be evaluated and would be integrated with the surveys for endangered and threatened species. Based on available staffing and funding, other native wildlife and plant species may also be surveyed. Standard survey techniques using trained biologists would be used to monitor endangered, threatened, rare, migratory, and resident species on Refuge lands. Predator populations would be monitored using several techniques, including monthly night surveys of predators and daytime surveys of predator signs.

> **Light-footed clapper rail:** (1) remove sand obstructing tidal circulation in the channel (see Section 2.3), (2) develop fringing freshwater marsh, (3) enhance *Spartina* vigor, (4) control human disturbance and free-roaming pets (see Section 2.3), (5) control pollutants, (6) control debris (see Section 2.3), (7) identify and resolve water quality problems, (8) coordinate with vector control personnel, (9) monitor population and distribution, (10) establish and monitor permanent vegetation transects, (11) monitor effects of sand removal and tidal enhancement on vegetation, and (12) monitor invertebrate populations (U.S. Fish and Wildlife Service 1985).
>
> **California least tern:** (1) develop and implement least tern management plan, (2) protect existing coastal feeding grounds, (3) restore tidal influence in portions of the north and south reaches of the estuary, (4) monitor least tern populations to determine status, distribution, and progress of management during the breeding season, (5) determine factors affecting the choice of location for roosting, loading, and feeding areas used during the breeding and post-breeding seasons, and (6) identify factors causing colony disruption and nest site abandonment (U.S. Fish and Wildlife Service 1985).
>
> **Least Bell's vireo:** (1) protect and manage riparian and adjacent upland habitats, (2) conduct annual population and habitat monitoring, (3) control cowbird parasitism, (4) control nonnative plant species, and (5) conduct habitat restoration (U.S. Fish and Wildlife Service 1998). The recovery actions for the least Bell's vireo would also benefit the recovery of the endangered southwestern willow flycatcher.

END

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